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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/823,195	03/29/2001	Xiao-An Zhang	10010538-1	1230

7590 02/02/2006

HEWLETT-PACKARD COMPANY  
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EXAMINER

EVERHART, CARIDAD

ART UNIT	PAPER NUMBER
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2891

DATE MAILED: 02/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/823,195	ZHANG ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Caridad M. Everhart	2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-3, 6-8, 11, 12, 15, 16, 18-23, 26-28, 31, 32, 35, 36 and 38-40 is/are allowed.
- 6) ☒ Claim(s) 4, 5, 9, 10, 13, 14, 17, 24, 25, 29, 30, 33, 34 and 37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1-19-2006 has been entered.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 15, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Reed (US 5,589,692).

Reed discloses a molecular switching device(col. 3, lines 22-25). The device disclosed by Reed has a band gap which is induced by electrical field(col. 20, lines 3-10 and col. 6, lines 7-13), in which there is a change between molecular orbital conformations. With respect to the limitation of alternately localized and delocalized, this is simply a recitation of the theoretical mechanism of delocalization, and would therefore be encompassed by the disclosure made by Reed of delocalization(col. 20, lines 3-10). That there is an energy barrier between different conformations implies that

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there are energy minima and maxima(col. 13, lines 22-28). The molecules can be between electrodes(Fig. 9). The molecules can be used in information storage, which includes memories(col. 28, lines 48-55 and col. 28, lines 64-67). It can be seen in Fig 7A that the molecules have groups that can rotate around bonds. It is expected that the bonds have stretching modes as well, as this is a property of bonds when the thermal energy is available at room temperature and higher temperatures.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

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not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 3,6-8,11,12,16,18,19,21-23,26-28,31-32,35,36, and 38-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reed as applied to claim 1 above in view of Heath, et al (US 6,198,655B1).

Reed is silent with respect to the recited limitations of the claims with respect to the first and second states and the relationship to the rotor portion and with respect to the junction as recited in the claims.

Although Reed is silent with respect to the details recited in the claims, it would have been obvious to one of ordinary skill in the art at the time of the invention from Fig. 3 and relating Fig. 3 to Fig. 4a and Fig. 4b that there are rotor portions of the molecule as shown in Fig. 3 and labeled 3 in the figure and that Fig. 4a and 4b show the minima and the maxima in the energy of the molecule with the conformation changes. In addition, the molecule has extended conjugation as shown in Fig. 3, and that this can also be a mechanism of raising the molecule to an excited state(col. 3,lines 25-28), as is well known in the art that there can be pi-bond breaking and forming as part of the conformation changes.

With respect to the dimensions recited, it would have been obvious to one of ordinary skill in the art at the time of the invention to have chosen the dimensions, because these are variables of the art, and nanometer dimensions are known in the art

in the formation of memory devices and Reed discloses nanoelectronics(col. 3, lines 40-45).

Heath et al discloses a molecular switch(col. 2, lines 35-36). The operation of the switch is by the change in energy level as shown by Fig. 5A and 5B, which are energy diagrams(col. 2, lines 61-67). There is a change in the configuration(col. 3, lines 37-41) of the molecules, which is the same as a change in the conformation. The molecular material is between electrodes(col. 4, lines 37-47). The molecular shape change causes an energy barrier (col. 5, lines 55-67), which satisfies the limitation that the band gap change occurs via molecular conformation change. The configuration change includes rotation under applied voltage or electric field, and it can be seen in Fig. 4B that there is extended pi bonding in the molecule which would change in energy level as indicated by the energy diagrams of Fig. 5A and 5B(col. 6, lines 15-25 and 40-52). Fig. 4B also shows the folding. The electrode wires are at an angle(col. 8, lines 64-67), as they are disclosed to be perpendicular. They are also crossing as they are disclosed to be on top of other wires(col. 9, lines 1-5 and col. 2, lines 34-36). The devices which are formed may be memory cell(col. 9, lines 7-10). The dimensions of the devices are nanometers(col. 1, lines 50-54).

Heath, et al is relied upon for its disclosure of the formation of a junction using a molecular switch.

It would have been obvious to one of ordinary skill in the art at the time of the invention that the molecular switch taught by Reed could be used in the connection of a junction such as that taught by Heath, et al and that the dimensions using the molecular

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switch taught by Reed could be in the order of nanometers because one of the improvements over the prior art disclosed by Reed is that the size using the molecular switch taught by Reed can be larger than that of the prior art of record.

***Allowable Subject Matter***

Claims 4,5, 9,10, 13,14,17,24,25,29,30,33,34, and 37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record does not teach the recited compounds.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caridad M. Everhart whose telephone number is 571-272-1892. The examiner can normally be reached on Monday through Fridays 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, B. Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
CARIDAD EVERHART  
PRIMARY EXAMINER

C. Everhart  
1-31-2006